

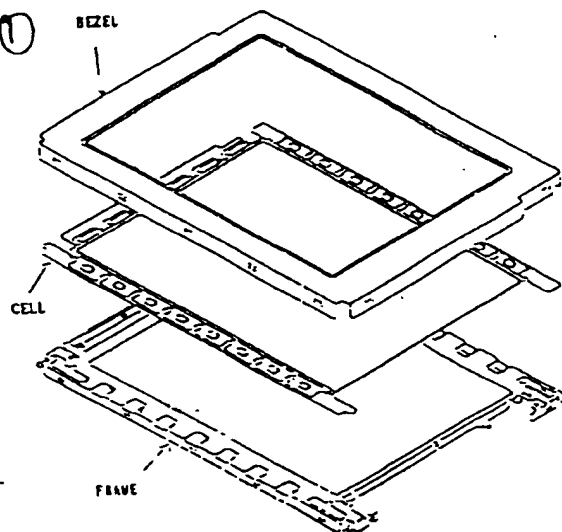
E

Cell Support Assembly without Screw



XP 000487692

p. 33 - ①



In these days a large amount of cost has been invested for the development of the Liquid Crystal Display (LCD) panel, and new technology has been created. One great issue is how to assemble the LCD panel. It is an important issue of how to and what to assemble in order to produce a high reliability, high-quality, and low-cost LCD. This disclosure provides the solution for these assembling issues.

In conventional technology, we have assembled the cell to recess the mold or tie it by screws within the bezel and frame. This method tends to break the screw hole and take many hours to assemble.

The new disclosed method (Figure) can change assembly to one action, which is to put the cell on a frame and connect it with a bezel by ratchet. Therefore, assembly is changed very easily and reassembly can be done easily by releasing the ratchet. This method can produce high reliability, high quality, and savings on the total cost. A cell, a frame, a bezel, and a silicon rubber are used in this method.

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 05080334
PUBLICATION DATE : 02-04-93

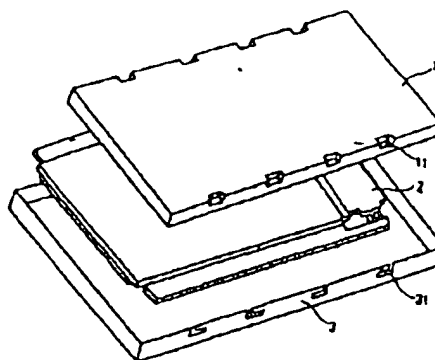
APPLICATION DATE : 20-09-91
APPLICATION NUMBER : 03270013

APPLICANT : ROHM CO LTD;

INVENTOR : HIRATSUKA KAZUYUKI;

INT.CL. : G02F 1/1335 G02F 1/1333

TITLE : BACK LIGHT HOLDING STRUCTURE
OF LIQUID CRYSTAL DISPLAY DEVICE



ABSTRACT : PURPOSE: To cope with a decrease in the thickness of the liquid crystal display device by engagement pieces separately formed on a frame with plural engagement parts provided on the reflecting-surface side edge part of a back light.

CONSTITUTION: The engagement parts 11 are arranged at the reflecting-surface side edge part of a back light unit 1. The number of the engagement parts 11 is determined according to the size of the liquid crystal display device, and when normally about four engagement parts are arranged at the side edge part on one side, there is no problem in practical use. Those engagement parts 11 may optionally be disposed symmetrically between the right and left side edge parts or zigzag. Then the engagement pieces 31 to engage the engagement parts 11 are formed on the frame 3 opposite the engagement parts 11 by as many as the engagement parts. The engagement pieces 31 are folded toward the engagement parts 11 to position and fix the back light unit 1 to the frame 3, and the thickness is reducible as compared with a conventional screw fixing method.

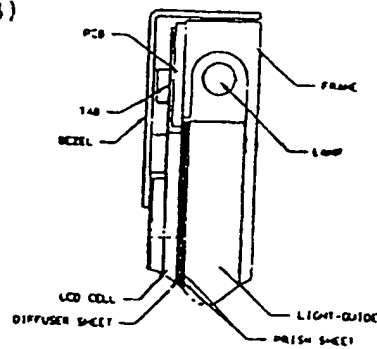
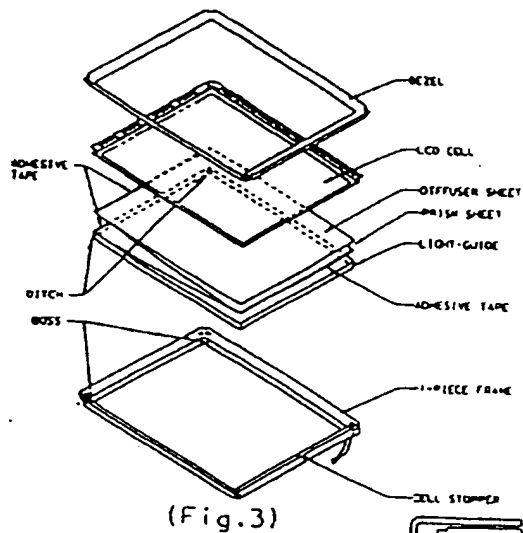
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LPL0001800

3387-151

Structure Design for Liquid Crystal Display Module — Continued

guide assembly. Light-guide, prism sheet (one or two sheets) and diffuser sheet have some adhesive tapes on each edge to form like one sheet. Therefore, it is easy to remove some foreign materials inside each gap because they are piled up. If they were stacked and have an adhesive tape on all, it would be impossible to do that.

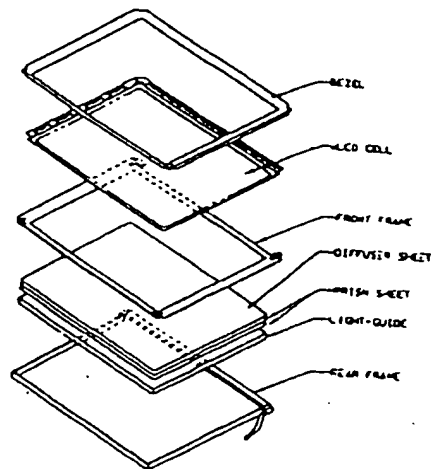


LPL0001801

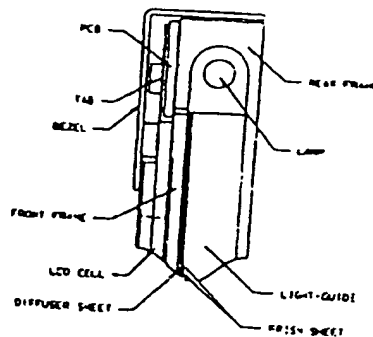
Second, Fig. 6 shows the example of this new structure design for backlight assembly. Backlight frame changed from two pieces to one piece. Opening area of three sides except the

Structure Design for Liquid Crystal Display Module

XP 000556325 p 71-73-③



(Fig. 1)

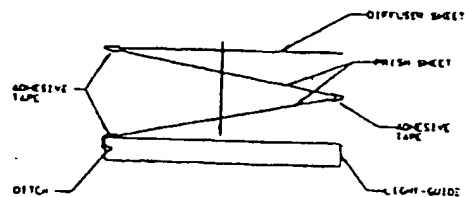


(Fig. 2)

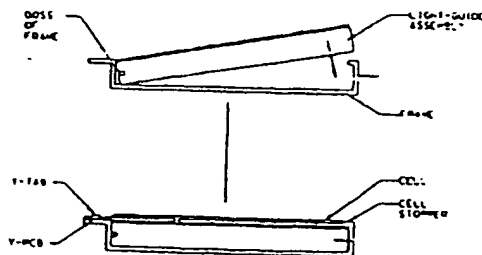
Disclosed is a structure design for Liquid Crystal Display (LCD) module which enables thin profile and low cost simultaneously. Fig. 1 (assembly drawing) and Fig. 2 (cross section) are current LCD module designs. Fig. 3 (assembly drawing) and Fig. 4 (cross section) show the example of this new structure design for LCD module. First, Fig. 5 shows the detail of Light-

Structure Design for Liquid Crystal Display Module — Continued

opposite side of Y-TAB side is extended in order to put light-guide assembly in frame. Two bosses are added on the frame of Y-TAB side to fit two ditches on light-guide. These two bosses are fulcrum of light-guide assembly. Design is to fix Z-direction of light-guide assembly by snap fit with rib of LCD cell stopper.



(Fig. 5)



(Fig. 6)

The number of backlight frames can be decreased from two to one and can eliminate the thickness of LCD module by the wall thickness because the rib of cell stopper has two functions. Besides, the way of handling backlight unit requires no change. Therefore, if new designed structure of this LCD module is adapted, it is possible to design thin profile and low cost LCD module.

FROM: LCD PRODUCT PLANNING

FAX NO.: 82 346 470 5819

98-07-07 08:56R P.01



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TE (0506) 3 40 39 00
TX (0506) 3 40 39 00
FAX (0506) 3 40 39 16

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PatentamtEuropäisches
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Patent OfficeReceiving
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des brevetsSection de
Dépôt

Kim, Yong Bum
2-1402 Samsung Changai Apt.,
454-2 Songjeong-dong
Kumi-shi,
Kyungsangbook-do
REPUBLIQUE DE CORÉE

Date/Date
30/06/98

Label/Étiquette	Assembly No./Application No./Demande n°/Patent No./Brevet n°
	98106383.7-2205
Applicant/Depositant/Demandeur/Patentholder/Breveté/Titulaire LG ELECTRONICS INC.	

DESIGNATION AS INVENTOR - COMMUNICATION UNDER RULE 17(3) EPC

You have been designated as inventor in the above-mentioned European patent application. Below you will find the data contained in the Designation of Inventor and further data mentioned in Art. 128(5) EPC:

DATE OF FILING : 07.04.98

PRIORITY : KR/08.04.97/ KR 9712899
KR/17.04.97/ KR 9714278

TITLE : LCD device, LCD board and display or computer comprising a LCD device

DESIGNATED STATES : AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE

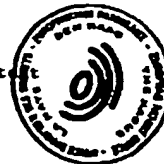
INVENTOR (PUBLISHED = 1, NOT PUBLISHED = 2):

1/Yun, Hee Young/102-1108 Doosan Mansion, 20-1 Nantong-dong/Kumi-shi, Kyungsangbook-do/KR
1/Moon, Kyo Hun/254 Daeseong1-li, Apo-eup/Kimcheon-shi, Kyungsangbook-do/KR
1/Lee, Byoung Yun/128-208 Chukong Apt., 333 Cheoucheon-dong/Changan-ku, Suwon-shi, Kyunggi-do/KR
1/Kim, Yong Bum/2-1402 Samsung Changai Apt., 454-2 Songjeong-dong/Kumi-shi, Kyungsangbook-do/KR
1/Bang, Young Un/3-106 Woosung Apt., 872-20 Bonoh-dong/Ansan-shi, Kyunggi-do/KR

DECLARATION UNDER ARTICLE 81 EPC:

The applicant(s) has (have) acquired the right to the European patent under an agreement dated 080497

RECEIVING SECTION



F 1048 (03.94)

7003006 25/06/98

010

LPL0001804

3387-155

Applicant:

LG Electronics Inc.

20 Yoido-dong,
Youngdungpo-Ku,

Seoul
Korea

Title: LCD device, LCD board and display or
computer comprising a LCD device

Attorney's File: P 14538

Art: Patent Application

Country: EPC

Priority: KR P 97-12899 of April 8, 1997
KR P 97-14278 of April 17, 1997

**Official
Filing Number:**

Filing Date: April 7, 1998

LPL0001805

3387-156



Antrag auf Erteilung eines europäischen Patents / Request for grant of a European patent / Requête en délivrance d'un brevet européen

Bestätigung einer bereits durch Telefax (Téléfax) eingereichten Anmeldung / Confirmation of an application already
filed by facsimile / Confirmation d'une demande déjà déposée par télécopie
Wenn ja, Datum der Übermittlung der Telefaxe und Name der Erfindungsbehörde / If yes, facsimile date and name
of the authority with which the documents were filed / Si oui, date d'envoi de la télécopie et nom de l'autorité de dépôt

☐ Ja / Yes / Oui

Datum / Date

Benannte / Authority / Autorité

Nur für amtlichen Gebrauch / For official use only / Cadre réservé à l'administration			
Anmeldenummer / Application No. / N° de la demande	KEY	1	
Tag des Eingangs (Regel 24(2)) / Date of receipt (Rule 24(2) / Date de réception (règle 24(2))	DREC	2	
Tag des Eingangs beim EPA (Regel 24(4)) / Date of receipt at EPO (Rule 24(4) / Date de réception à l'OEB (règle 24(4))	RENA	3	
Anmeldetag / Date of filing / Date de dépôt		4	
Tabulatorien-Positionen / Tabulation marks / Arrêts de tabulation			
Es wird die Erteilung eines europäischen Patents und gemäß Artikel 34 die Prüfung der Anmeldung beantragt / Grant of a European patent, and examination of the application under Article 34, are hereby requested / Il est demandé la délivrance d'un brevet européen et, conformément à l'article 34, l'examen de la demande	EXAM 4	5	<input checked="" type="checkbox"/> Prüfungsantrag in einer zugelassenen Nichtamtssprache (siehe Merkblatt 8, S. 2) / Request for examination in an admissible non-EPO language (see Notice 8, S. 2) / Requête en examen dans une langue non officielle autorisée (voir notice 8, S. 2)
Zeichen des Anmelders oder Vertreters (max. 15 Positionen) / Applicant's or representative's reference (maximum 15 spaces) / Référence du demandeur ou du mandataire (max. 15 caractères ou espaces)	AREF	6	P 14538
ANMELDER / APPLICANT / DEMANDEUR			
Name / Nom			
Anschrift / Address / Adresse			
APPR 01 #			
# DEST #			
Zustellanschrift / Address for correspondence / Adresse pour la correspondance			
PADR			
Staat des Wohnortes oder Sitzes / State of residence or of principal place of business / Etat du domicile ou du siège			
Staatsangehörigkeit / Nationality / Nationalité			
Telefon / Telephone / Téléphone			
Telex / Télex			
Telefax / Fax / Téléfax			
Weiterer/Anmelder auf Zusatzblatt / Additional applicant(s) on additional sheet / Autret(s) demandeur(s) sur feuille additionnelle			
VERTRETER / REPRESENTATIVE / MANDATAIRE:			
Name / Nom			
Bitte einen Vertreter angeben, der in das europäische Patentregister eingetragen und an den zugewiesen wird / Name only one representative, who is to be listed in the Register of European Patents and to whom application is to be made / Il indique qu'un seul mandataire ou seul agent au Registre européen des brevets et auquel application sera faite			
FREPO1			
Geschäftsanschrift / Address of place of business / Adresse professionnelle			
Telefon / Telephone / Téléphone			
Telex / Télex			
Telefax / Fax / Téléfax			
Weiterer/Vertreter auf Zusatzblatt / Additional representative(s) on additional sheet / Autret(s) mandataire(s) sur feuille additionnelle			
TRAN			
FILL			
P 14538			

SPAT/POES Form 1001 - 07/97

LPL0001806

3387-157

Vollmacht / Authorisation / Pouvoir: Ist beigelegt / is enclosed / ci-joint		20																															
Ist registriert unter Nummer / has been registered under No. / a été enregistré sous le n°		21	Nummer Number Numéro																														
ERFINDER / INVENTOR / INVENTEUR: Anmelder ist (sind) erschein(e)r Erfinder / The applicant(s) is (are) the sole inventor(s) / Le(s) demandeur(s) est (sont) le (sont) seul(s) inventeur(s) Erfindernennung auf gesondertem Schriftstück / Designation of inventor attached / Voir la désignation de l'inventeur ci-jointe		22																															
DEZEICHNUNG DER ERFINDUNG / TITLE OF INVENTION / TITRE DE L'INVENTION: <table border="1"> <tr> <td>TIDE</td> <td>TIEN</td> <td>TIFR</td> </tr> </table>		TIDE	TIEN	TIFR	23	<input checked="" type="checkbox"/>																											
TIDE	TIEN	TIFR																															
		24	LCD device, LCD board and display or computer comprising a LCD device																														
PRIORITÄTserklärung / DECLARATION OF PRIORITY / DECLARATION DE PRIORITE		25	<table border="1"> <tr> <td>Staat / State / Etat</td> <td>Anmeldetag / Filing date / Date de dépôt</td> <td>Aktenzeichen / Application No. / N° de la demande</td> </tr> <tr> <td></td> <td>KR 08.04.1997</td> <td>P 97-12899</td> </tr> <tr> <td></td> <td>KR 17.04.1997</td> <td>P 97-14278</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	Staat / State / Etat	Anmeldetag / Filing date / Date de dépôt	Aktenzeichen / Application No. / N° de la demande		KR 08.04.1997	P 97-12899		KR 17.04.1997	P 97-14278																					
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	KR 08.04.1997	P 97-12899																															
	KR 17.04.1997	P 97-14278																															
Weitere Prioritätsordnungen auf Zusatzblatt / Additional declarations of priority on additional sheet / Autres déclarations de priorité sur feuille additionnelle																																	
BIOLOGISCHES MATERIAL Die Erfindung betrifft biologisches Material oder seine Verwendung, das nach Regel 28 hinterlegt worden ist.		26	MATIERE BIOLOGIQUE L'invention concerne étou utilisée la matière biologique, déposée conformément à la règle 28																														
BIOLOGISCHES MATERIAL The invention relates to and/or uses biological material deposited under Rule 28		27	<table border="1"> <tr> <td>Satz(n) / page(s)</td> <td>Zeil(n) / line(s) / ligne(s)</td> </tr> </table>	Satz(n) / page(s)	Zeil(n) / line(s) / ligne(s)																												
Satz(n) / page(s)	Zeil(n) / line(s) / ligne(s)																																
Die Angaben nach Regel 20(1) d) sind in den technischen Anmeldeunterlagen enthalten auf / The particulars referred to in Rule 20(1) d) are given in the technical documents in the application on / Les indications visées à la règle 20(1) d) figurent dans les pièces techniques de la demande à la / sur werden später mitgeteilt / will be submitted later / seront communiquées ultérieurement Die Empfangsbescheinigung(en) der Hinterlegungsstelle ist (sind) beigelegt / The receipt(s) of deposit issued by the depository institution is (are) enclosed / Les récépissés de dépôt déposé(s) par l'autorité de dépôt est (sont) ci-jointe(s) wird (werden) nachgereicht / will be filed later / sera (seront) produite(s) ultérieurement		27a	<input type="checkbox"/>																														
		28	<input type="checkbox"/>																														
		28a	<input type="checkbox"/>																														
Verzicht auf die Verpflichtung des Antragstellers nach Regel 28(3) auf gesondertem Schriftstück / Waiver of the right to an undertaking from the requester pursuant to Rule 28(3) attached / Renoncement, sur document distinct, à l'engagement du requérant au titre de la règle 28(3)		29	<input type="checkbox"/>																														

Falls das biologische Material nicht vom Anmelder, sondern von einem Dritten hinterlegt wurde: / Where the biological material has been deposited by a person other than the applicant: / Lorsque la matière biologique a été déposée par une personne autre que le demandeur:

Ermächtigung nach Regel 28(1)(d) / Authorisation under Rule 28(1)(d) / Autorisation en vertu de la règle 28(1)(d)

ist beigelegt / is enclosed / ci-jointe

wird nachgereicht / will be filed later / sera produite ultérieurement

NUCLEOTID-UND AMINOSÄURESEQUENZEN / NUCLEOTIDE AND AMINO ACID SEQUENCES / SEQUENCES DE NUCLEOTIDES ET D'ACIDES AMINÉS

Die Beschreibung enthält ein Sequenzprotokoll nach Regel 27a(1) / The description contains a sequence listing in accordance with Rule 27a(1) / La description contient une liste de séquences selon la règle 27a(1)

Der vorgeschriebene maschinenlesbare Datenträger ist beigelegt / The prescribed machine readable data carrier is enclosed / Le support de données prescrit déchiffirable par machine est annexé

Es wird hiermit erklärt, daß die auf dem Datenträger gespeicherte Information mit dem schriftlichen Sequenzprotokoll übereinstimmt (Regel 27a(2)) / It is hereby stated that the information recorded on the data carrier is identical to the written sequence listing (Rule 27a(2)) / Il est déclaré par le présent que l'information figurant sur le support de données est identique à celle que contient la liste de séquences selon la règle 27a(2)

BENENNUNG DER VERTRAGSSTAATEN UND ERKLÄRUNGEN HIERZU

1. Hiermit werden sämtliche Vertragsstaaten des EPU benannt, die bei Einreichung dieser Anmeldung dem EPU angehören

2. Der Anmelder beabsichtigt derzeit, Benennungsgebühren für die nachfolgend angekreuzten Vertragsstaaten zu entrichten

DESIGNATION OF THE CONTRACTING STATES AND ASSOCIATED DECLARATIONS

1. All States which are Contracting States to the EPC at the time of this application are hereby designated.

2. The applicant currently intends to pay designation fees for the States marked below with a cross

DEST

- ☒ AT Österreich / Austria / Autriche
- ☒ BE Belgien / Belgium / Belgique
- ☒ CH/LI Schweiz und Liechtenstein / Switzerland and Liechtenstein / Suisse et Liechtenstein
- ☒ DE Deutschland / Germany / Allemagne
- ☒ DK Dänemark / Denmark / Danemark
- ☒ ES Spanien / Spain / Espagne
- ☒ FI Finnland / Finland / Finlande
- ☒ FR Frankreich / France / France
- ☒ CY Cyprus
- ☐ —

Please list the Contracting States to which the EPC applies and for which the fees have been or will be paid. / Please list the States to which the EPC applies and for which the fees have been or will be paid. / Veuillez indiquer les États contractants à l'égard desquels les taxes de désignation ont été ou seront payées.

Es wird beantragt, für die unter Nr. 2 nicht angekreuzten Vertragsstaaten von der Zustellung von Mitteilungen nach Regel 85a(1) und Regel 69(1) abzusehen, ist ein automatischer Abbuchungsauftrag erteilt worden (Feld 43), so wird beantragt, bei Ablauf der Grundfrist nach Artikel 79(2) Benennungsgebühren nur für die unter Nr. 2 angekreuzten Vertragsstaaten abzubuchen

It is requested that no communications under Rule 85a(1) and Rule 69(1) be notified concerning the Contracting States not marked with a cross under No. 2. If an automatic debit order has been given (section 43), it is requested that, when the basic period specified in Art. 79(2) expires, designation fees be debited only for the Contracting States marked with a cross under No. 2.

30 Name und Anschrift des Erfinders / Name and address of inventor / Nom et adresse du déposant

30a

30b

31

32

DESIGNATION D'ÉTATS CONTRACTANTS ET DÉCLARATIONS À CE PROPOS

1. Sont désignés tous les États qui sont des États contractants de la CBE à la date du dépôt de la présente demande

2. Le demandeur se propose actuellement de payer des taxes de désignation pour les États cochés ci-dessous

- ☒ GB Vereinigtes Königreich / United Kingdom / Royaume-Uni
- ☒ GR Griechenland / Greece / Grèce
- ☒ IE Irland / Ireland / Irlande
- ☒ IT Italien / Italy / Italie
- ☒ LU Luxemburg / Luxembourg / Luxembourg
- ☒ MC Monaco / Monaco / Monaco
- ☒ NL Niederlande / Netherlands / Pays-Bas
- ☒ PT Portugal / Portugal / Portugal
- ☒ SE Schweden / Sweden / Suède
- ☐ —
- ☐ —

Please list the Contracting States to which the EPC applies and for which the fees have been or will be paid. / Please list the States to which the EPC applies and for which the fees have been or will be paid. / Veuillez indiquer les États contractants à l'égard desquels les taxes de désignation ont été ou seront payées.

☒ Prière de ne pas procéder à la signification des notifications prévues par les règles 85a(1) et 69(1) pour les États contractants n'ayant pas été cochés au n° 2. Si un ordre de prélèvement automatique a été donné (rubrique 43), prière de ne prélever à l'expiration des délais de base tels que définis à l'article 79(2) que les taxes de désignation pour les États contractants cochés au n° 2.

Verschiedene Anmelder für verschiedene Vertragsstaaten / Different applicants for different Contracting States / Différents demandeurs pour différents États contractants		33	Namen der hier Anmelderisi und benannte Vertragsstaaten / Name of applicant and designated Contracting States / Nomins du des demandeurs et des États contractants désignés																
APPR 02 # 																			
ERSTRECKUNG DES EUROPÄISCHEN PATENTS Diese Anmeldung gilt als Antrag, die europäische Patentanmeldung und das darauf erteilte europäische Patent auf alle Nicht-Vertragsstaaten des EPU zu erstrecken, mit denen am Tag ihrer Einreichung „Erstreckungsabkommen“ bestehen (Derzeit: Albanien, Litauen, Lettland, Rumänien, Slowenien). Die Erstreckung wird jedoch nur wirksam, wenn die vorgeschriebene Erstreckungsgebühr entrichtet wird.	EXTENSION OF THE EUROPEAN PATENT The application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all non-Contracting States to the EPC with which "extension agreements" exist on the date on which the application is filed (Present situation: Albania, Lithuania, Latvia, Romania, Slovenia). However, the extension only takes effect if the prescribed extension fee is paid.	34	EXTENSION DES EFFETS DU BREVET EUROPÉEN La présente demande est réputée constituer une requête en extension des effets de la demande de brevet européen et du brevet européen dérivé sur la base de cette demande à tous les États non parties à la CBE avec lesquels il existe un «accord d'extension» à la date du dépôt de la demande (Situation actuelle : Albanie, Lituanie, Lettonie, Roumanie, Slovénie). Toutefois l'extension ne produit ses effets que s'il est acquitté la taxe d'extension prescrite.																
<div style="text-align: right; border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">EXPT</div> <p>Der Anmelder beabsichtigt derzeit, die Erstreckungsgebühr für die nachfolgend angegebenen Staaten zu entrichten: / The applicant currently intends to pay the extension fee for the States marked below with a cross: / Le demandeur se propose actuellement d'acquiescer la taxe d'extension pour les États dont le nom est coché ci-après:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Albanien / Albanie / Albanie</td> <td style="width: 20%; text-align: center;">AL</td> </tr> <tr> <td>Litauen / Lithuania / Lituanie</td> <td style="text-align: center;">LT</td> </tr> <tr> <td>Lettland / Latvia / Lettonie</td> <td style="text-align: center;">LV</td> </tr> <tr> <td>Rumänien / Romania / Roumanie</td> <td style="text-align: center;">RO</td> </tr> <tr> <td>Slowenien / Slovenia / Slovénie</td> <td style="text-align: center;">SI</td> </tr> <tr> <td>_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>_____</td> <td style="text-align: center;">_____</td> </tr> </table> <p style="font-size: small; margin-top: 10px;"> Please for States with which "extension agreements" exist after this form has been passed / Cocher les États avec lequel "extension agreements" exist after this form has been passed / Pour les États à qui s'applique des "accords d'extension" mentionnés en regard dans l'impression de présent formulaire </p>		Albanien / Albanie / Albanie	AL	Litauen / Lithuania / Lituanie	LT	Lettland / Latvia / Lettonie	LV	Rumänien / Romania / Roumanie	RO	Slowenien / Slovenia / Slovénie	SI	_____	_____	_____	_____	_____	_____	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div style="width: 100px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div style="font-size: small;"> Nummer der früheren Anmeldung No. of earlier application Numéro de la demande initiale </div> </div>	
Albanien / Albanie / Albanie	AL																		
Litauen / Lithuania / Lituanie	LT																		
Lettland / Latvia / Lettonie	LV																		
Rumänien / Romania / Roumanie	RO																		
Slowenien / Slovenia / Slovénie	SI																		
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Es handelt sich um eine Anmeldung nach Art. 61(1)(b) / The application is an Art. 61(1)(b) application / La présente demande constitue une demande selon l'article 61(1)(b)		36																	
Patentansprüche / Claims / Revendications		37	Zahl der Patentansprüche Number of claims Nombre de revendications																
Zur Veröffentlichung mit der Zusammenfassung wird vorgeschlagen Abbildung Nr. / With the abstract it is proposed to publish figure No. / Il est proposé de publier avec l'abrége la figure n°		39	Nummer / Number / Numero																
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Viering et al

Die vorgeschriebene Liste über die diesem Antrag beigefügten Unterlagen ergibt sich aus der vorbereiteten Empfangsbescheinigung (Seite 6 dieses Antrages)

The prescribed list of documents enclosed with this request is shown on the prepared receipt (page 6 of this request)

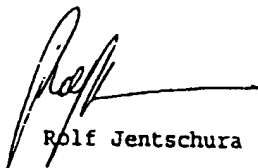
45

La liste prescrite des documents joints à cette requête figure sur le récépissé préalable (page 6 de la présente requête)

Unterschrift(en) des (der) Anmelders oder Vertreters /
Signature(s) of applicant(s) or representative(s) /
Signature(s) du (des) demandeur(s) ou du (des) mandataire(s)

Ort / Place / Lieu München

Datum / Date 07.04.1998


Rolf Jentschura

46

Für Angestellte nach Artikel 133(1) Satz 1 mit allgemeiner Vollmacht / For employees under Article 133(1), first sentence, having a general authorisation / Pour les employés mentionnés à l'article 133(1), 1^{re} phrase, munis d'un pouvoir général
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Name des oder der Unterzeichneten bitte mit Schreibmaschine wiedergeben. Bei juristischen Personen bitte die Stellung des oder der Unterzeichneten innerhalb der Gesellschaft mit Schreibmaschine angeben / Please type name under signature. In case of legal persons, the position of the signatory within the company should also be typed / Le ou les noms des signataires doivent être également dactylographiés. S'ils s'agit d'une personne morale, la position occupée du ou des signataires doit également être indiquée à la machine à écrire

Empfangsbescheinigung / Receipt for documents / Récépissé de documents 6

Liste der diesem Antrag beigefügten Unterlagen (Checklist of enclosed documents): Liste des documents annexés à la présente requête
Es wird hiermit der Empfang der unten bezeichneten Dokumente bescheinigt / Receipt of the documents indicated below is hereby acknowledged / Nous attestons le dépôt des documents désignés ci-dessous

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Patentanwälte
Viering, Jentschura
& Partner
Postfach 22 14 43
80504 München

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Anmeldenummer / Application No. / N° de la demande		
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Zeichen des Anmelders/Vertreters / Applicant's/ Representative's ref. / Référence du demandeur ou du mandataire	AREF	
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A. Anmeldeunterlagen und Prioritätsbeleg(e) / Application documents and priority document(s) / Pièces de la demande et document(s) de priorité		47	<table border="1"> <tr> <th>Stückzahl / Number of copies / Nombre d'exemplaires</th> <th>Bereitn. eines Stücks / Number of sheets in each copy / Nombre de feuilles par exemplaire</th> <th>Gesamtzahl der Abschriften / Total number of figures / Nombre total de figures</th> </tr> <tr> <td>1 Beschreibung / Description</td> <td>3</td> <td>8</td> </tr> <tr> <td>2 Patentansprüche / Claims / Révendications</td> <td>3</td> <td>3</td> </tr> <tr> <td>3 Zeichnungen / Drawings / Dessins</td> <td>3</td> <td>9</td> </tr> <tr> <td>4 Zusammenfassung / Abstract / Résumé</td> <td>3</td> <td>1</td> </tr> <tr> <td>5 Übersetzung der Anmeldeunterlagen / Translation of the application documents / Traduction des pièces de la demande</td> <td></td> <td></td> </tr> <tr> <td>6 Prioritätsbeleg(e) / Priority document(s) / Document(s) de priorité</td> <td></td> <td></td> </tr> <tr> <td>7 Übersetzung des lateinischen Prioritätsbelegs / Translation of priority document(s) / Traduction du libellé document(s) de priorité</td> <td></td> <td></td> </tr> </table>	Stückzahl / Number of copies / Nombre d'exemplaires	Bereitn. eines Stücks / Number of sheets in each copy / Nombre de feuilles par exemplaire	Gesamtzahl der Abschriften / Total number of figures / Nombre total de figures	1 Beschreibung / Description	3	8	2 Patentansprüche / Claims / Révendications	3	3	3 Zeichnungen / Drawings / Dessins	3	9	4 Zusammenfassung / Abstract / Résumé	3	1	5 Übersetzung der Anmeldeunterlagen / Translation of the application documents / Traduction des pièces de la demande			6 Prioritätsbeleg(e) / Priority document(s) / Document(s) de priorité			7 Übersetzung des lateinischen Prioritätsbelegs / Translation of priority document(s) / Traduction du libellé document(s) de priorité		
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4 Zusammenfassung / Abstract / Résumé	3	1																									
5 Übersetzung der Anmeldeunterlagen / Translation of the application documents / Traduction des pièces de la demande																											
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7 Übersetzung des lateinischen Prioritätsbelegs / Translation of priority document(s) / Traduction du libellé document(s) de priorité																											
B. Der Anmeldung ist der eingereichte Patentantrag folgende Unterlagen beizubringen / This application as filed is accompanied by the items below: / A la présente demande sont annexées les pièces suivantes:		48																									
1. Erfindermacht / Specific authorisation / Pouvoir spécifique		<input type="checkbox"/>																									
2. Allgemeine Vollmacht / General authorisation / Pouvoir général		<input type="checkbox"/>																									
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4. Früherer Recherchenbericht / Earlier search report / Rapport de recherche antérieur		<input type="checkbox"/>																									
5. Gebührenzahlungsvoucher (EPA Form 1010) / Voucher for the settlement of fees (EPO Form 1010) / Bonificatio de règlement de taxes (OEB Form 1010)		<input type="checkbox"/>																									
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3387-162

LPL0001811

Erfinderbenennung - Designation of inventor - Designation de l'inventeur

Amtliches Aktenzeichen:

Application No.:

No. de la demande:

Anwaltsakte:

Attorney's file:

Référence du mandataire.

P 14538

Der (Die) Anmelder:

The Applicant(s):

Le(s) demandeur(s):

LG Electronics Inc.

20 Yoido-dong,
Youngdungpo-Ku,
Seoul
Korea

der Erfindung:

of the invention:

de l'invention:

LCD device, LCD board and display or computer
comprising a LCD device

benennt (benennen) als Erfinder:

declare(s) as inventor(s):

désigne(at) en tant qu'inventeur(s):

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Das Recht auf das Patent ist auf den (die) Anmelder übergegangen:

The right to apply for the patent has passed to the applicant(s):

Le droit au brevet est passé au(x) demandeur(s):

durch Vertrag vom

08.04.1997

under an agreement dated

par contrat en date du

Der Unterzeichnende versichert, daß seines Wissens weitere Personen an der Erfindung nicht beteiligt sind.

München

07.04.1998


Rolf Gentschura

Ort, Datum

Place, Date

Lieu, Date

Unterschrift(en) des (der) Anmelder(s) oder Vertreter

Signature(s) of applicant(s) or representative

Signature(s) de (des) demandeur(s) ou de (des) mandataire(s)

Keine Beglaubigung - No legalization - Legalisation non nécessaire

LPL0001812

3387-163

LCD device, LCD board and display or computer comprising a LCD device

The invention relates to a liquid crystal display (LCD) device, a LCD board, a LCD indication device and a computer, especially a portable computer comprising the LCD device.-

In general, a liquid crystal display (LCD) device used for a computer such as a portable computer or for a portable display is shown in Fig. 1. Referring to Fig. 1, the LCD device includes a liquid crystal panel 20, a back light unit, and a driving circuit board 23. The back light unit is comprised of a luminescent lamp 11, a lamp housing 12 having a U-shape and surrounding the lamp 11, a light guide 13, a reflector 14 reflecting the incident light from the horizontal direction to the vertical direction, a protection sheet 15 contacting the light guide 13, a first prism sheet 16 and a second prism sheet 17 set on the protecting sheet 15 and condensing the incident light from the light guide 13 to some direction, a diffuser 18 diffusing the light from the first and second prisms 16 and 17 to a viewing area 21 of the liquid crystal panel 20 with a certain viewing angle, and a first support frame 19 supporting these elements.

Fig. 3 shows a cross-sectional view of the light-guiding plate 13 showing a gradual thickness decrease in cross-section as it extends away from the light source 11. A fluorescent lamp 11 as the light source is fixed at a thicker end of the light-guiding plate 13. When the fluorescent lamp 11 is turned on, the light 23 from the source 11 is reflected by the lamp housing 12 surrounding the fluorescent lamp 11. The reflected light transmits through the cross-section towards the other side (thinner end) of the light-guiding plate 13 as indicated by the arrows. Then, the light spreads all over the surface of the light-guiding plate 13 and reaches the display area 21 (Fig. 1) through the diffusion plate 18. At the same time, a thin film transistor formed on the liquid crystal panel controls a corresponding pixel according to the signals from the driving circuit 30 (Fig. 1) to selectively transmit the light which collectively realizes the display of images on the

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display area.

The liquid crystal display is usually combined with, for example, a notebook computer as an output screen. The following method is used to fix the liquid crystal display to a device such as a notebook computer.

Referring to Figs. 3a and 3b, in a conventional liquid crystal display, a ground supporting plate 30 is disposed on the first fastening frame 19. A mounting hole 33 is formed through the ground supporting plate 30 and the first fastening frame 19, as shown in Fig. 3b. Then, the ground supporting plate 30 and the first fastening frame 19 are fixed by a screw 31 as shown in Fig. 3a. In other words, a liquid crystal display is fixed to a device such as a notebook computer so as to fasten the first fastening frame 19 and the ground supporting plate 30 by a fastening element such as a screw.

However, the liquid crystal display becomes thicker due to the length of the screw according to the method as shown in Figs. 3a and 3b. Moreover, since the mounting hole 33 for the screw is formed on the front surface of the liquid crystal display, the display area of the liquid crystal display becomes narrow.

According to the structure described above, the LCD device operates as follows. The light from the luminescent lamp 11 is incident on the rear surface of the liquid crystal panel 20 through the back light unit. A control circuit place on the driving circuit board 30 controls the incident light on the viewing area 21 of the liquid crystal panel 20 to display images and characters.

Fig. 4 is a drawing showing a plan view of the final assembly structure of the conventional liquid crystal display device. Fig. 4 also shows the assembled result of a second support frame 40, liquid crystal panel 20 and back light unit having an assembly structure for mounting to a portable computer. The second support frame 40 is made of metal or plastic, and holds the liquid crystal panel 20 and the back light unit. Here, the driving circuit board 23 is located behind the rear part of the back light unit connected to the liquid crystal panel 20 with a flexible film (not shown).

Fig. 5 shows the assembly structure of the liquid crystal panel 20 and body 60 of the portable computer in the conventional method. The second support frame 40 is mounted to a rear case 50 of the portable computer using screws 43 through screw holes 41. A front case (not shown) having a blank area adjusted to the viewing area is joined at the rear case 50. That is, the liquid crystal panel 20 is mounted with the rear case 50 by the screws 43 locked in the normal direction of the display surface through the screw holes 41 formed on that surface. Although not shown in the drawings, the front case is mounted on the LCD device, opening the viewing area 21 and covering the other parts.

In general, as the size of the portable computer is designed for easy movement, the same goes for an A4 copy sheet, for example. Therefore, the ratio of the viewing area to the whole surface area of the display and the thickness of the display device affect the quality of the portable computer. However, in a conventional portable computer, screw holes 41 are located on edge portions of the display surface in order to join the second support frame 40 to the rear case 50. As the display area has a screw frame area 42 (Fig. 4) for forming the holes 41, the ratio of the area of the LC panel to the viewing area 21 is reduced.

Furthermore, in the conventional portable computer, as the screws 43 are locked to the liquid crystal display device and the rear case 50 in the normal direction of the display surface, the display part is thick enough to form an assembly device 51 for the screws 43, such as screw holes 41. The second support frame 40 is also large enough to have a space for supporting the screw holes 41. Thus, it is difficult to reduce the weight of the portable computer.

Accordingly, a liquid crystal device is needed having a high viewing ratio of the display, low weight, and reduced thickness for a computer, such as a portable computer.

The present invention is directed to a LCD device, a LCD board and a display or computer comprising a LCD device that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

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3387-166

An object of the present invention is to increase the ratio of the viewing area of the display to nearly the whole area of a mounting frame of the LCD board.

Another object of the present invention is to provide a
5 thin, light weight display unit.

The invention is especially described in the claims.-

The features and advantages of the invention will be set forth in the written description which follows, and in part will be apparent from the description, or may be learned by
10 practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance
15 with the purpose of the present invention, as embodied and broadly described, a LCD device especially comprises a liquid crystal (LC) panel including a display area; a light source optically joined with the LC panel; a first support frame coupled to a surface of the light unit and sides of the LC
20 panel; a second frame coupled to edges of the LC panel and sides of the first support frame; an outer casing; and a fastening part joining together the first support frame, the second support frame, and the outer casing through the sides of the first support frame, the second support frame, and the
25 outer casing.

In another aspect of the present invention, a portable computer especially comprises a LCD device having a display surface and a first plurality of side surfaces; a body having an input device; a cover, coupled to an edge of the body,
30 having a second plurality of side surfaces; and a fastening unit attaching the first plurality of side surfaces of the LCD device to the second plurality of side surfaces of the cover, the LCD device being mounted to the cover.

In another aspect of the present invention, a portable
35 computer comprises a LCD device especially having a first side surface; a body having an input device; a cover joined with the body and having a second side surface; and a fastening unit joining together the LCD device and the cover through the first

and second side surfaces of the LCD device and the cover, respectively.

In a further aspect of the present invention a LCD device comprises a first support frame having a first fastening member at a side surface of the first support frame; a reflector unit adjacent the first support frame; a light source adjacent to the reflector unit; a light guide unit adjacent the reflector unit; a protection unit adjacent the light guide unit; a prism unit adjacent the protection unit; a diffuser unit adjacent the prism unit; a LC panel adjacent the diffuser unit; and a second support frame having a second fastening member at a side surface of the second support frame, wherein the reflector unit, the protection unit, the prism unit, and the diffuser unit, the LC panel are between the first and second support frame, and the first and second support frame are attached to each other through the first and second fastening members through the side surfaces of the first and second support frames.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 is a perspective drawing showing the structure of the conventional LCD device;

Fig. 2 is a cross-sectional view of a light-guiding plate and a fluorescent lamp;

Fig. 3a is a plan view of a LCD showing a screw frame of a first fastening frame;

Fig. 3b is a cross-sectional view of a LCD illustrating a first fastening frame, a lamp housing, and ground support plates fixed together by a screw;

Fig. 4 shows a plan view of the final assembly structure of

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the LC panel, support frame, and back light unit in the conventional LCD device;

Fig. 5 shows an assembly structure of the LCD device in the conventional portable computer;

5 Fig. 6 is a perspective view showing the assembly structure of the parts of the LC board in accordance with one embodiment of the present invention;

Fig. 7 is a perspective view the assembly structure of a LCD board, a rear cover or casing frame, and a front cover in accordance with the present invention;

10 Fig. 8a and 8b are cross-sectional side views of a LCD board according to the present invention illustrating mounting holes at a side walls of the mounting frame, Fig. 8c showing a sectional part view along the section line in Fig. 8b; and

15 Fig. 9 shows an assembly structure of an LCD device and portable computer in accordance with the present invention.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

20 The present invention provides mounting holes for fastening pins on a side wall of a LCD board instead of on a front surface of a LCD board. For example, Fig. 8a and 8b show first mounting holes 410a formed on opposite side walls of a mounting frame 710. With reference to Fig. 6, the structure of a LCD board according to the present invention will be described in detail.

25 Referring to Fig. 6, on an inner support frame 190 made of plastic, for example, a reflector 140, a light guide 130, a protection sheet 150, a first prism sheet 160, a second prism sheet 170, a diffuser 180, and a LC panel 300 are stacked sequentially. The inner support frame has a bottom wall 192 and four side walls 191 extending at right angles from the bottom wall. On opposite side walls 191 of the inner support frame 190, a plurality of lateral first screw holes 410a are formed.

30 At the edge of the light guide 130, a luminescent lamp 110 and a lamp housing 120 are mounted. The lamp housing 120 has an U-shape and surrounds the luminescent lamp 110 at three sides adjacent to the respective side wall 191 of the inner support frame.

In order to join the inner support frame 190, the LC panel 300, the illuminating assembly 130-180 and the lamp housing 120, a outer support frame 400 preferably made of metal is mounted at the side wall of the inner support frame 190. When mounted, the
5 outer support frame 400 and the inner support frame overlap eachother at their side walls 401, 191. At the side wall 401 of the outer support frame 400, a plurality of second through holes 410b aligned with the first screw holes 410a as shown in Fig. 8a are formed.

10 Referring to Figs. 8a and 8b, the outer frame 400 and the inner frame 190 may be mounted together by a plurality of tongues 402 bent into respective depressions in the side wall of the inner frame 190. According to Figs. 8b and 8c, the side wall of the inner frame 190 is formed with a plurality of lugs 410e in
15 which the screw holes 410a are formed and which extend through respective cutouts 410 of the side wall 401 of the outer frame 401.

Referring to Fig. 7, a LCD board 700 comprising the mounting frame 700 e.g. of the inner support frame 190 and the outer
20 support frame 400 accomodating the LC panel 300 and the illuminating assembly (not shown in Fig. 7) is joined with a casing frame 500 at its side wall 712 and a front frame 520, the LCD board 700 and the casing frame 500 defining a LCD device according to the invention. At the side wall of the casing frame
25 500, third through holes 410c aligned with the first screw holes and second through holes 410a,b are formed. The casing frame 500 and the LCD board 700 are joined to each other by fastening devices such as clamping pins or screws 430, which extend through and may be locked to the second and third through holes 410b and
30 410c. Although not shown in the drawings, the screws 430 are locked with the first screw holes 410a.

In another embodiment, in order to join the outer support frame 400 and the casing frame 500, an adhesive device such as double-sided adhesive tape can be used instead of the second and
35 the third screw holes 410b and 410c. This example has an added advantage in that no screws or clamping pins are needed which makes the manufacturing method easy.

In a further embodiment, the casing frame 500 and the outer

support frame 400 are joined to each other using hooks and/or other suitable fastening devices including adhesives formed at inner sides of the casing frame 500. This embodiment also does not need fastening devices such as screws 430. .

5 Accordingly, in the present invention, the assembling or fastening devices are engaging the side walls of the display and are not at the front or back side. The assembling devices are preferably screws, hooks or, adhesive materials, for example. The direction of the assembling devices is normal to the side
10 wall of the display, that is, parallel direction with the front (viewing) outer surface of the display. Moreover, the assembling devices may be formed on the upper and lower sides of the display.

Referring to Fig. 9, the LCD board is mounted to a portable
15 computer. One of the advantages of the portable computer or note book according to the present invention over the conventional portable computer is the higher ratio of the viewing area. Because there are no fastening elements on the display surface, the outer frame of the display area of the present invention is
20 narrower than that of conventional ones. Thus, the ratio of the viewing area can be maximized and the thickness of the display part is made thinner than that of conventional ones.

— Furthermore, as the volume of the frames of the present invention is smaller than that of conventional ones, the portable
25 computer of the present invention is lighter. Additionally, as it is not necessary to have screws, the cost for manufacturing can be reduced.

It will be apparent to those skilled in the art that various
30 modifications and variations can be made in the computer having a LCD device of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is

1. LCD device comprising a LCD board (700) including a LC panel (300), an illuminating assembly (130-180) with a light source (110, 120), and a mounting frame (710) accomodating the LC panel and the illuminating assembly and extending along the edges (401) of the outer surface of the board (700) and the side walls thereof, and a casing frame (500) in which the LCD board (700) is mounted by its mounting frame (710) by means of fastening elements engaging the mounting frame at at least one of the side walls of the board in a direction in parallel with the plane of the outer surface of the board.
2. LCD device according to claim 1, the mounting frame (710) including at said at least one side wall (712) a plurality of lateral mounting holes (410a) into which the fastening elements in the form of a plurality of pins (430) are engaged, each of the mounting holes and the pins extending in a plane in parallel with the plane of the outer surface of the board, each of the pins extending through one of adjoining through holes (410c) in respective side walls (512) of the casing frame (500).
3. LCD device according to claim 2, the mounting frame (710) comprising an outer support frame (400) and an inner support frame (190) being attached to each other at their side walls (401, 191), the side walls of the outer support frame overlapping the side walls of the inner support frame, at least one of the side walls of the inner support frame being formed with said mounting holes (410a) being aligned with respective openings (410b, 410d) in the adjoining side wall of the outer support frame.
4. LCD device according to claim 3, the inner support frame (190) including at its at least one side wall (191) a plurality of lugs (410e) formed with the mounting holes (410a), the respective openings (410d) in the adjoining side wall (401) of the outer support frame (400) being formed as a plurality of cutouts each of which receiving one of the lugs.

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cutouts each of which receiving one of the lugs.

5 5. LCD device according to one of claims 2 to 4, the pins being screwed pins or screws (430) and the mounting holes in the mounting frame being screw holes (410a).

6. LCD device according to one of claims 3 to 5, the illuminating assembly comprising:

10 a reflector unit (140) adjacent to the inner support frame (190);
a light source (110, 120) adjacent to the reflector unit;
a light guide unit (130) adjacent to the reflector unit;
15 a protection unit (150) adjacent to the light guide unit;
a prism unit (160, 170) adjacent to the protection unit;
a diffuser unit (180) adjacent to the prism unit;
20 the LC panel (300) being placed adjacent to the diffuser unit and between the diffuser unit and the outer support frame (190).

25 7. LCD device according to claim 1 the fastening elements being formed as double sided adhesive strips between and engaging the mounting frame (710) and the casing frame (500).

30 8. LCD board (700) comprising a LC panel (300), an illuminating assembly (130-180) with a light source (110, 120), and a mounting frame (710) accomodating the LC panel and the illuminating assembly and extending along the edges (401) of the outer surface of the board (700) and the side walls thereof, and including lateral mounting holes (410a) formed in at least one of the side walls (712) of the mounting frame for
35 receiving fastening pins (430) extending in parallel with the outer surface of the board.

9. LCD board (700) according to claim 8, the mounting frame

- (710) comprising an inner support frame (190) and an outer support frame (400) between which the LC panel (300) and the illuminating assembly (130-180) with the light source (110, 120) are arranged and which include overlapping side walls (191, 401) at which the outer support frame (400) and the inner support frame (190) are attached to each other, the mounting holes (410a) being formed in at least one of the side walls of the inner support frame.
10. LCD board according to claim 9, the illuminating assembly comprising:
- a reflector unit (140) adjacent to the inner support frame (190);
 - the light source (110, 120) adjacent to the reflector unit;
 - a light guide unit (130) adjacent to the reflector unit;
 - a protection unit (150) adjacent to the light guide unit;
 - a prism unit (160, 170) adjacent to the protection unit;
 - a diffuser unit (180) adjacent to the prism unit;
- the LC panel (300) being placed adjacent to the diffuser unit and between the diffuser unit and the outer support frame (400).
11. Portable display device comprising a LCD device (700, 500) according one of claims 1 to 7.
12. Computer comprising a LCD device (700, 500) according to one of claims 1 to 7.
13. Computer according to claim 12 in the form of a portable computer comprising a main body (600) with an input device a hinged cover joined with the main body which includes the casing frame in which the LCD board is laterally fastened at opposite side walls of the LCD board.

ABSTRACT OF THE DISCLOSURE

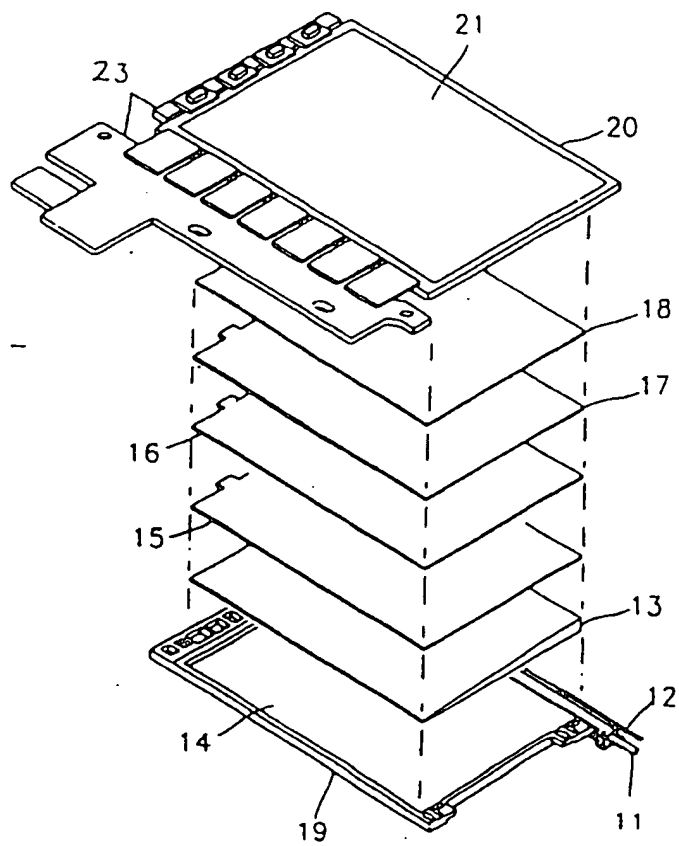
A LCD device (700, 500) includes a LC panel (300) having a display area, a light source joined with the LC panel, a mounting frame (710) frame coupled to a surface of the light unit and
5 sides of the LC panel, an casing frame (500), and a fastening element (430) joining together the mounting frame and the-outer casing frame through the sides of the mounting frame and the outer casing frame. (Fig. 7)

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FIG. 1
PRIOR ART

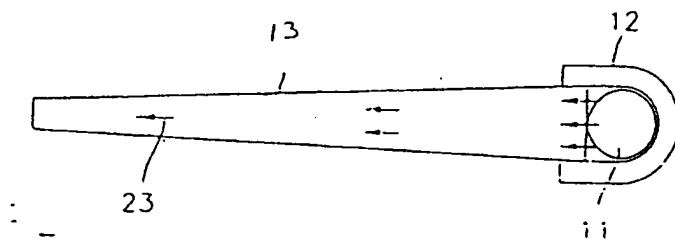


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FIG. 2
PRIOR ART



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FIG. 3a

PRIOR ART

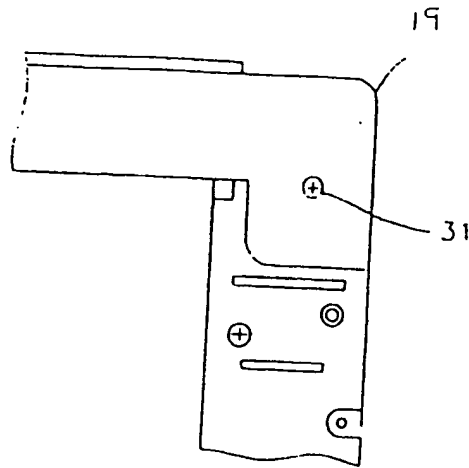
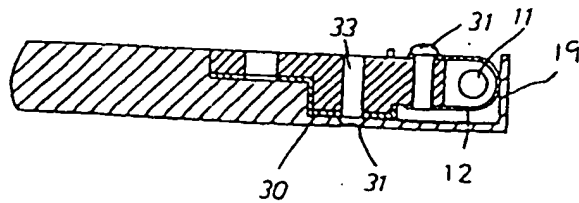


FIG. 3b

PRIOR ART

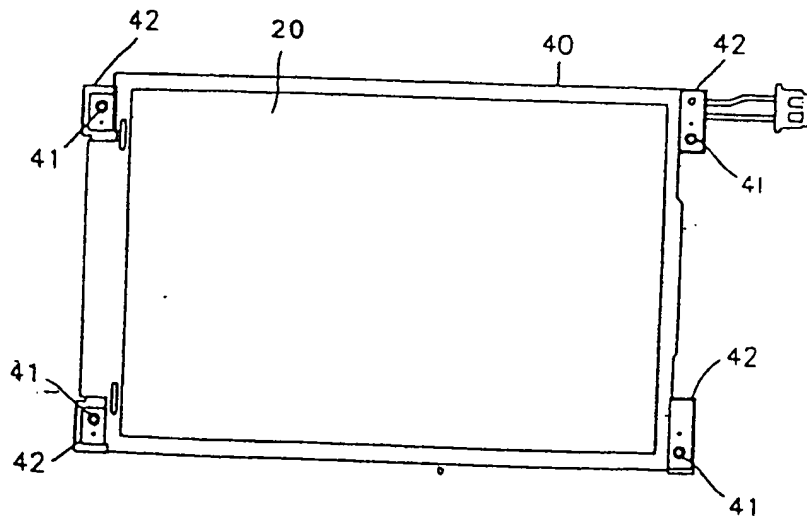


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FIG. 4
PRIOR ART

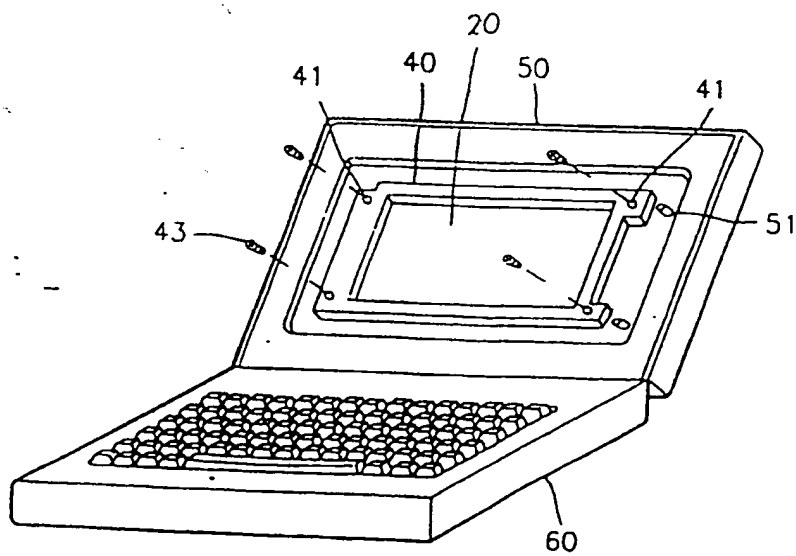


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FIG. 5
PRIOR ART

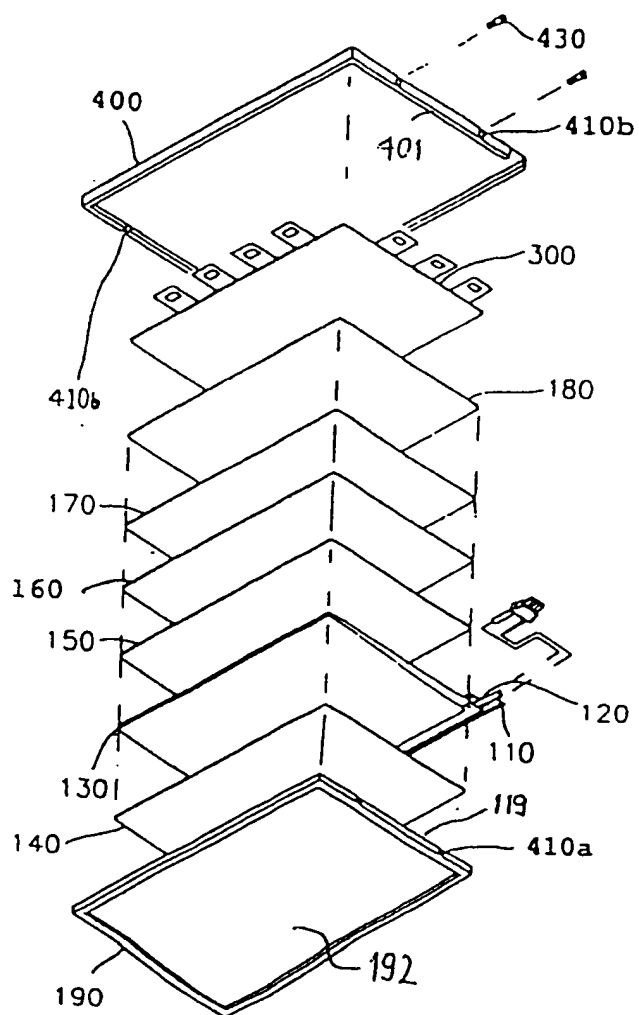


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FIG. 6

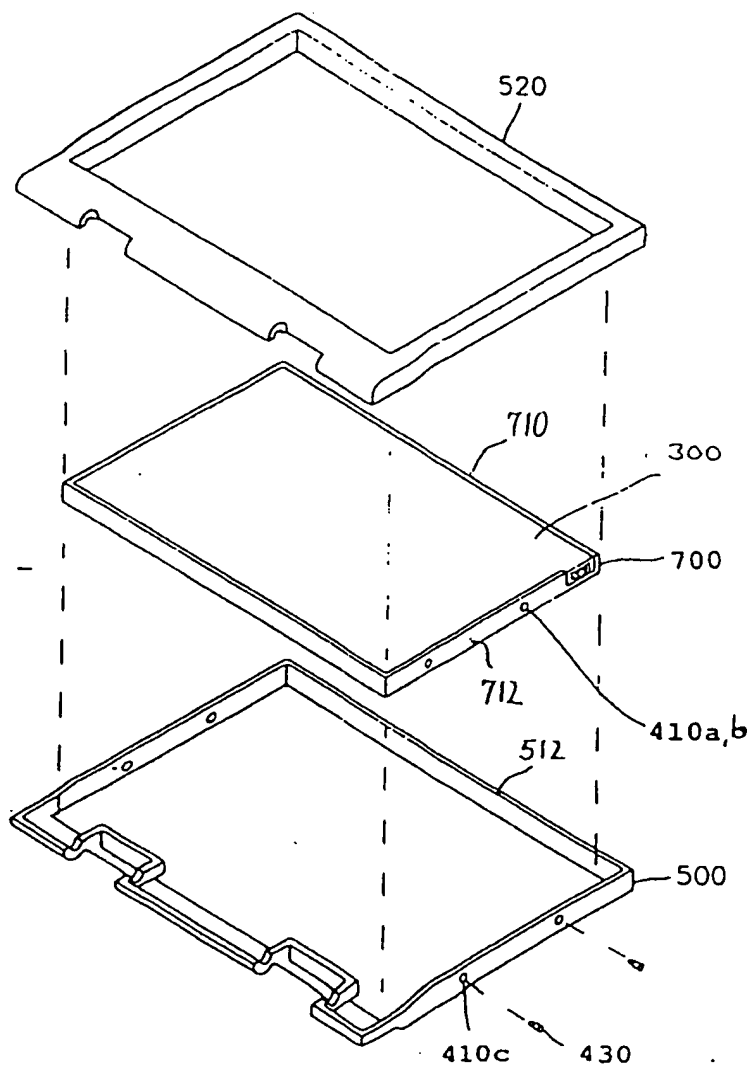


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FIG. 7



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Fig. 8a

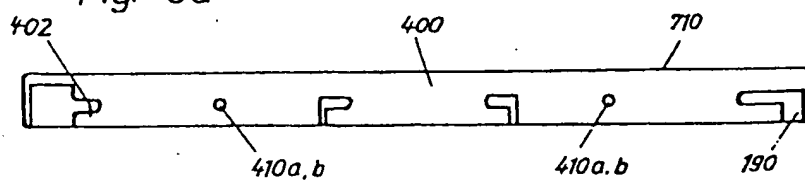


Fig. 8b

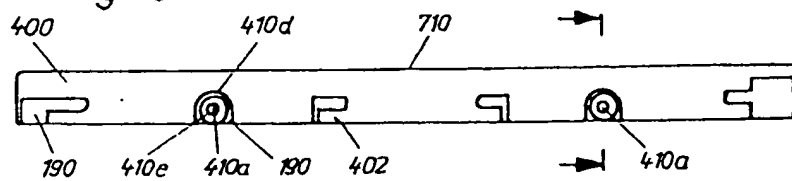
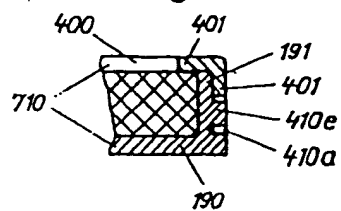


Fig. 8c

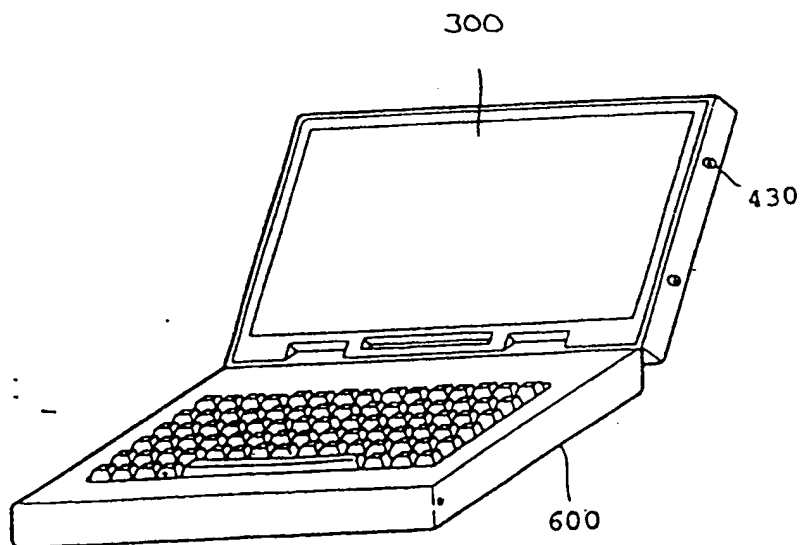


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FIG. 9



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